

## Ship Self Defense for DDG 1000

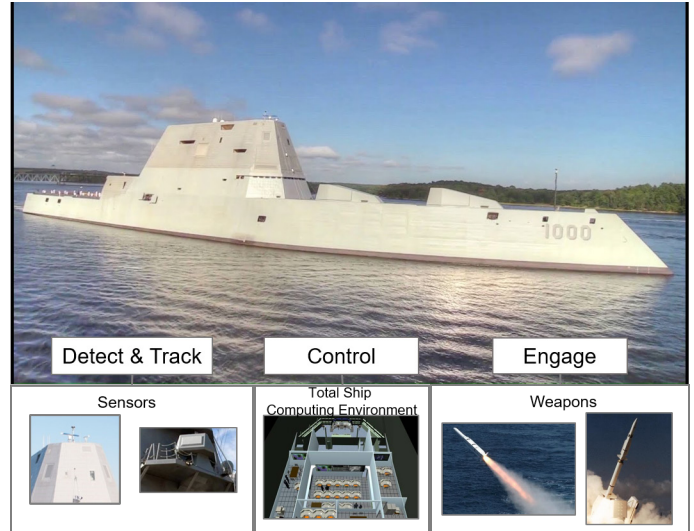
### Executive Summary

- The Navy conducted 4 of the 10 DDG 1000 tests planned for the Self-Defense Test Ship (SDTS) (3 of 6 planned developmental tests, and 1 of 4 planned integrated developmental and operational tests). The Navy canceled one integrated test event and one developmental test event because of unacceptably low performance predictions.
- The Navy discovered severe problems during the DDG 1000 SDTS events that will adversely affect the operational effectiveness of the combat system if not corrected. Consequently, the Navy has put the test program on hold and is currently working to identify the root-cause of these problems.
- The DDG 1000 self-defense test program is at risk of being inadequate if the six remaining SDTS events are not completed.

### System

The DDG 1000 ship self-defense combat system, *Zumwalt* Combat System (ZCS), consists of several programs:

- Total Ship Computing Environment (TSCE) – The command and control architecture unique to ZCS.
- Multi-Function Radar (MFR/SPY-3) – The new X-band radar going on DDG 1000-class guided-missile destroyers and the USS *Gerald R. Ford* (CVN 78).
- Cooperative Engagement Capability (CEC) – The tracker and sensor data fusion and distribution system.
- Surface Electronic Warfare Improvement Program (SEWIP) Block 2 (SLQ-32B(V)6) – The passive electronic sensor used to detect and identify hostile radars.
- Evolved Sea Sparrow Missile (ESSM) Block 1 with Joint Universal Weapon Link (JUWL) – The short-range missile interceptor used to defeat air threats at close-in ranges, and the system used for radar-missile communication and support. Within the U.S. Navy, only the DDG 1000-class ships and the USS *Gerald R. Ford* (CVN 78) use ESSM with JUWL.
- Standard Missile 2 (SM-2 Block IIIA) with JUWL – The unique ZCS variant of SM-2 used to defeat air threats at longer ranges.



- MK 57 Vertical Launch System (VLS) - The DDG 1000-only vertical missile launcher variant.

### Mission

Commanders use the DDG 1000 self-defense systems (TSCE, SPY-3, CEC, SEWIP Block 2, ESSM and SM-2 with JUWL, and VLS) to protect the ship and its sailors from enemy air threats in both clear and jammed environments.

### Major Contractors

- TSCE and SPY-3: Raytheon Company, Integrated Defense Systems – Tewksbury, Massachusetts
- ESSM and SM-2 with JUWL, VLS: Raytheon Missile Systems – Tucson, Arizona
- SEWIP Block 2: Lockheed Martin – Syracuse, New York
- CEC: Raytheon Company, Integrated Defense Systems – St. Petersburg, Florida

### Activity

- The Navy began this program in FY03, and DOT&E put it on oversight in FY03. This is the first time DOT&E has included this program in its annual report.
- The Navy conducted 4 of the 10 DDG 1000 tests planned for the SDTS (3 of 6 planned developmental tests, and 1 of 4 planned integrated developmental and operational tests). The Navy canceled one integrated test event and one critical developmental test event because of unacceptably low

performance predictions. The remaining test events are at risk of not occurring for several reasons:

- The Navy plans to remove the SPY-3 radar and TSCE computer equipment on the SDTS at the end of 2QFY20.
- Several other test programs are competing for aerial target resources, time on the SDTS, and allocated time on the range.

- Root cause determination and correcting problems found in developmental and early integrated testing has repeatedly delayed event execution.
- The DDG 1000 Probability of Raid Annihilation (PRA) modeling and simulation testbed has been a critical portion of developmental testing and risk reduction. It is still undergoing development and finalization prior to the operational test runs for the record.

## Assessment

- The Navy has discovered severe problems during the DDG 1000 SDTS events that will adversely affect the operational effectiveness of the combat system if not corrected. Consequently, the Navy has put the test program on hold and is currently working to identify the root cause of these problems.
- The DDG 1000 self-defense test program is at risk of being inadequate if the six remaining SDTS events are not completed. These events are required for DOT&E's evaluation of DDG 1000 self-defense capability, and the Navy cannot

accredit the DDG 1000 PRA testbed without data from these events.

- For use in operational testing, the DDG 1000 PRA testbed requires additional development and improvements, particularly to its missile, radar, and electronic warfare models.

## Recommendations

The Navy should:

1. Provide an execution strategy for completing the DDG 1000 self-defense assessment on the SDTS, to include updated schedule and resource information.
2. Retain test resources not used for the SDTS events for use during the DDG 1000 lead ship air defense scenarios in the event the six remaining SDTS events cannot be executed due to schedule constraints associated with the removal of the SPY-3 radar.
3. Continue to develop and improve the DDG 1000 PRA testbed, in particular its missile, radar, and electronic warfare models.